

Computer Networks

Subject Code

CA 1114A

4th Semester

Prof (Dr.) Prashant Chandra Pradhan

**Electronics and Communication
Engineering Department
SMIT**

Chapter 1

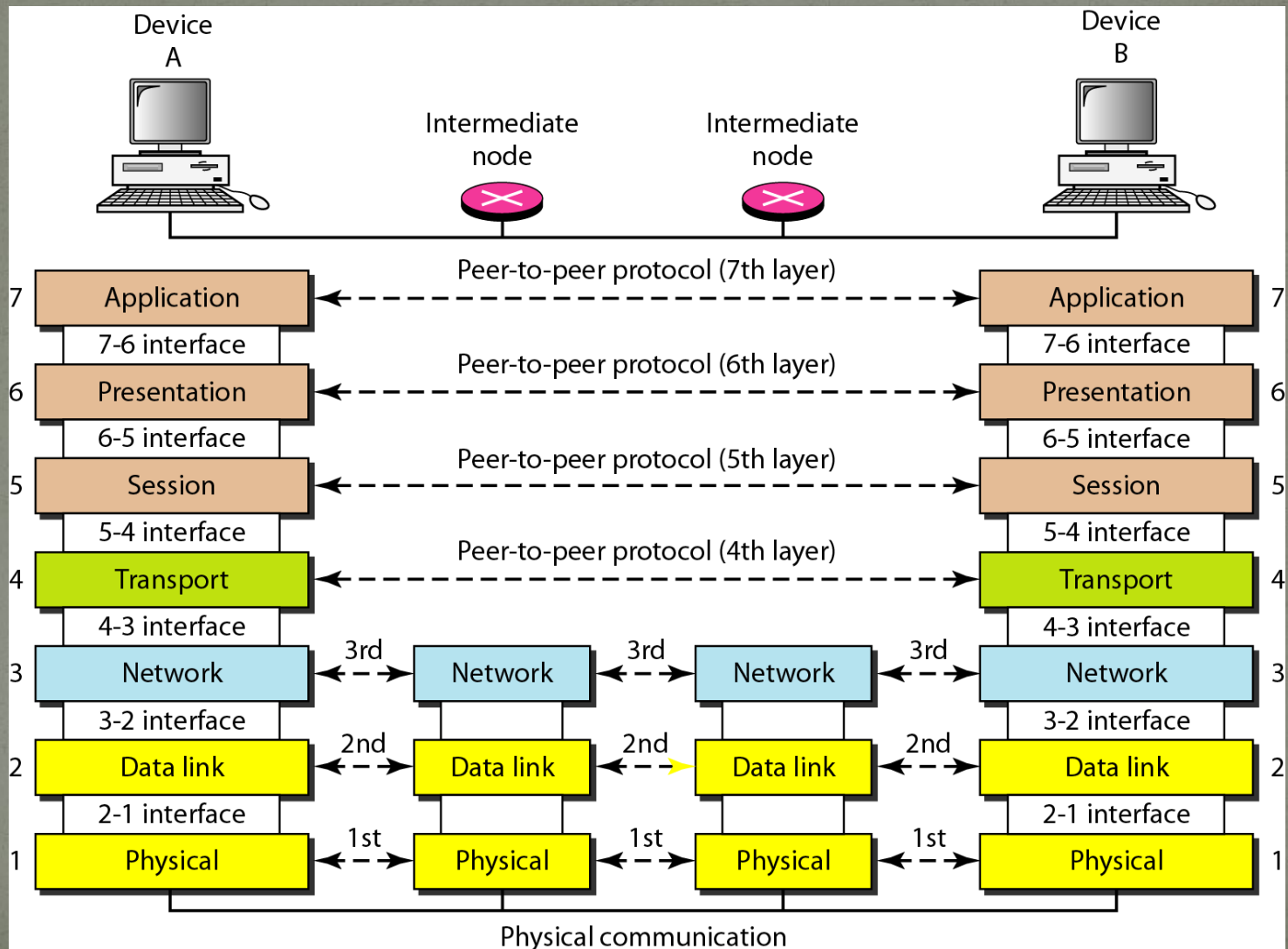
Module

Introduction to Computer Networks and layered
Architecture

Contents

- Peer-to-peer Process
 - Protocol
 - Elements of a Protocol
 - Example
- MAC Addressing (Physical Addresses)
- IP Addressing (Logical Address)
- Port Address

Peer to Peer Process



Protocol

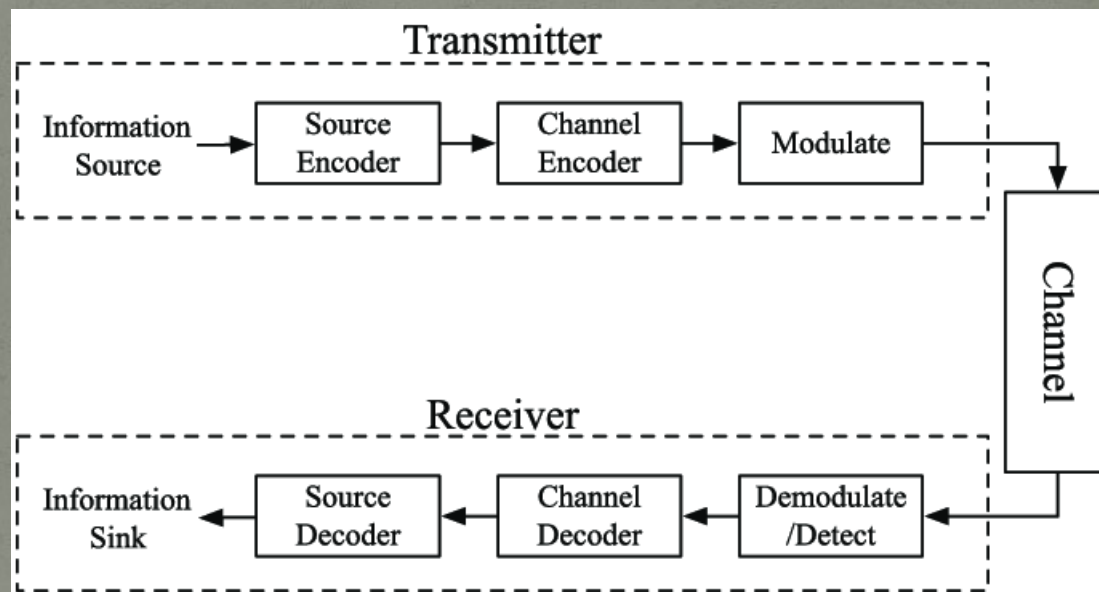
- Definition
 - “The communication is govern by agreed-upon series of rules and conventions called Protocols.”

Protocol

- Elements of a Protocol
 - Message Encoding
 - Message Formatting and Encapsulation
 - Message Timing
 - Message Size
 - Message Delivery Option

Elements of Protocol

- Message encoding



Elements of Protocol

- Message Formatting and Encapsulation
- Agreed Format
- Sender and the receiver
- Encapsulation the information to identify the sender by the receiver

Elements of Protocol

- Message Size
- Large message is broken into small sizes
- Transmission Medium

Elements of Protocol

- Message Timing
- Flow Control (synchronization)
- Response timeout

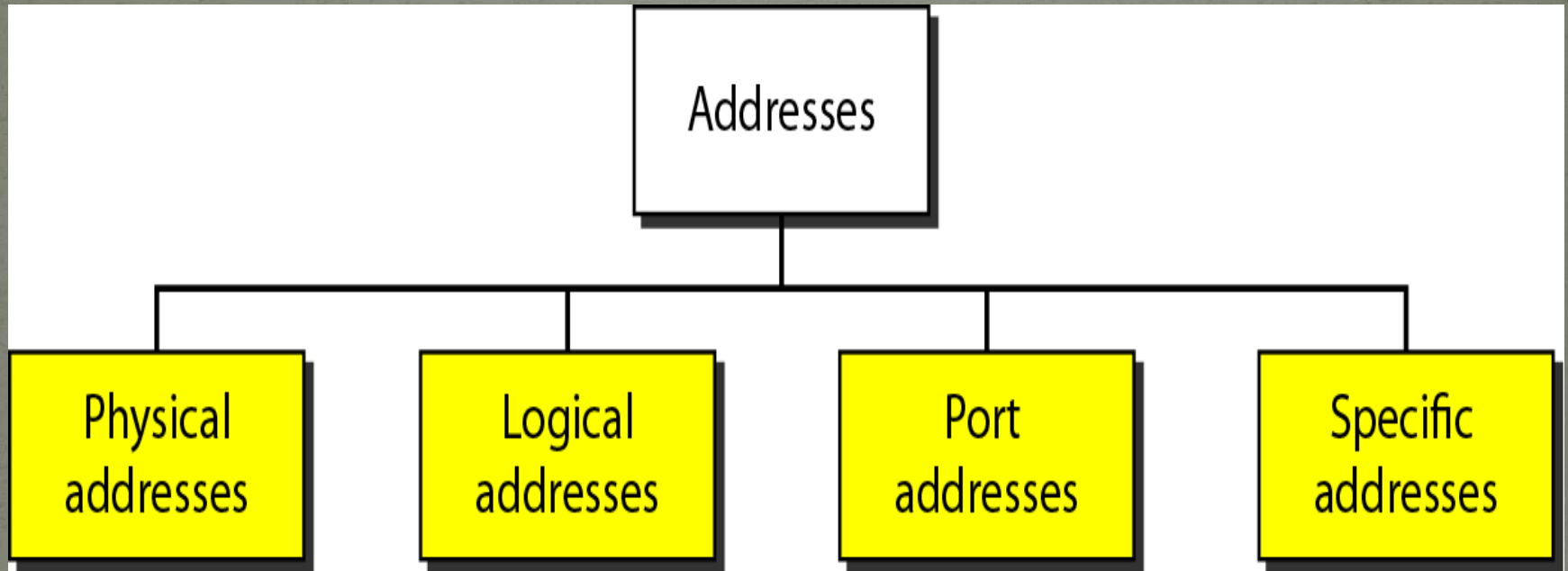
Elements of Protocol

- Message delivery option
 - Unicast (one to one receiver)
 - Multicast (Source to set of receivers)
 - Broadcast (source to all the receivers)

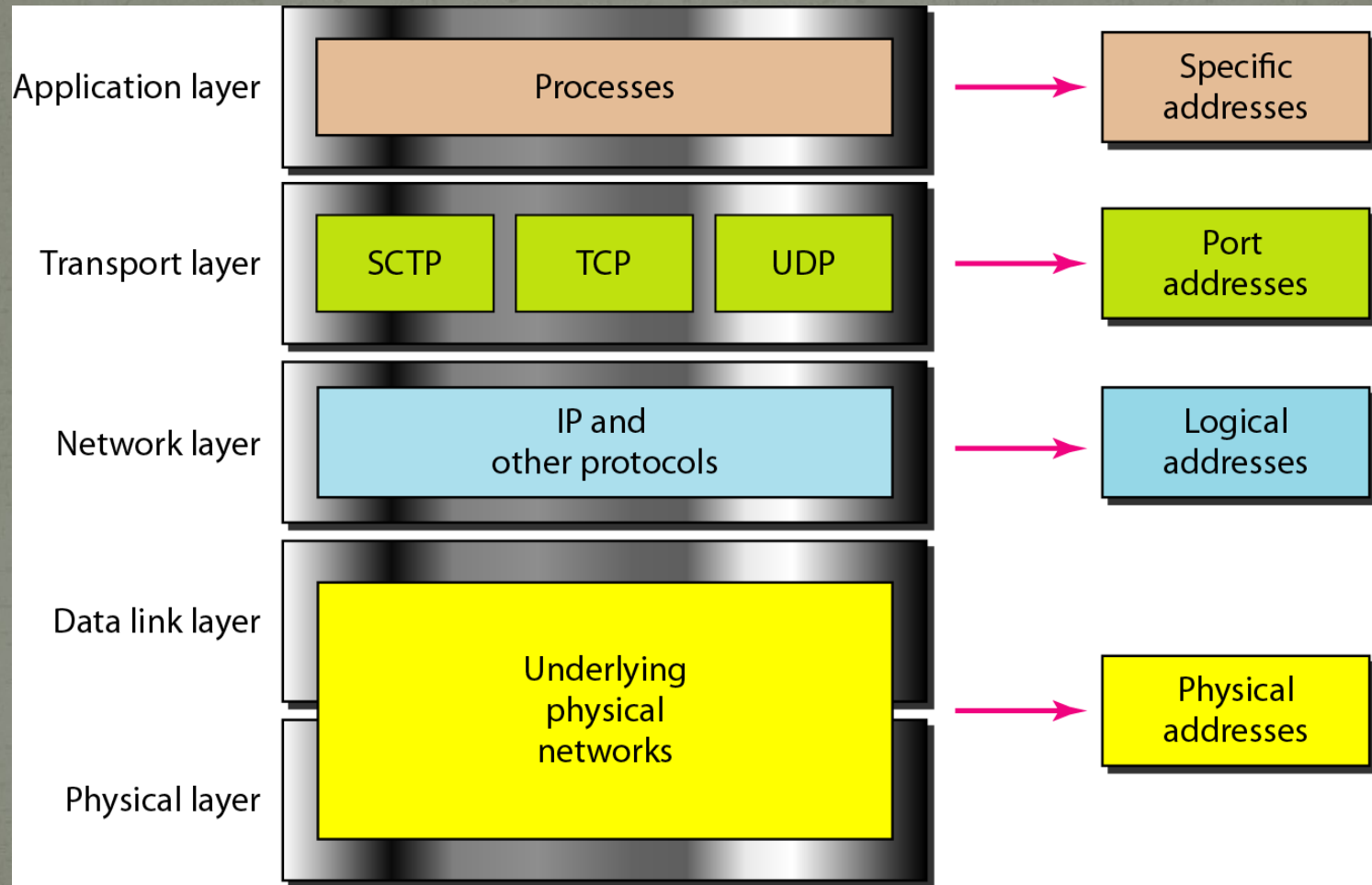
Some of the Protocols

- Physical layer (Hardware, raw bit stream)
 - FDDI (fibre distributed data Interface) ISDN Integrated Services Digital Network)
- Data link layer (frames to bits)
 - IEEE 802.3(ETHERNET) 802.5(TOKEN RING) IEEE 802.2(LLC)
- Network layer (Addressing, Routing)
 - IP ARP RARP ICMP (Internet Control Message Protocol) OSPF
- Transport layer (Packet, flow control and Error handling)
 - TCP BGMP (Border Gateway Multicast Protocol)
- Session layer (Syncs and session)
 - RPC (Remote Procedure Call) NetBIOS
- Presentation layer (Translation)
 - JPEG
- Application layer (User Interface)
 - DNS FTP SNMP SMTP NFS TELNET

Addressing



Relationship of layers and addresses in TCP/IP

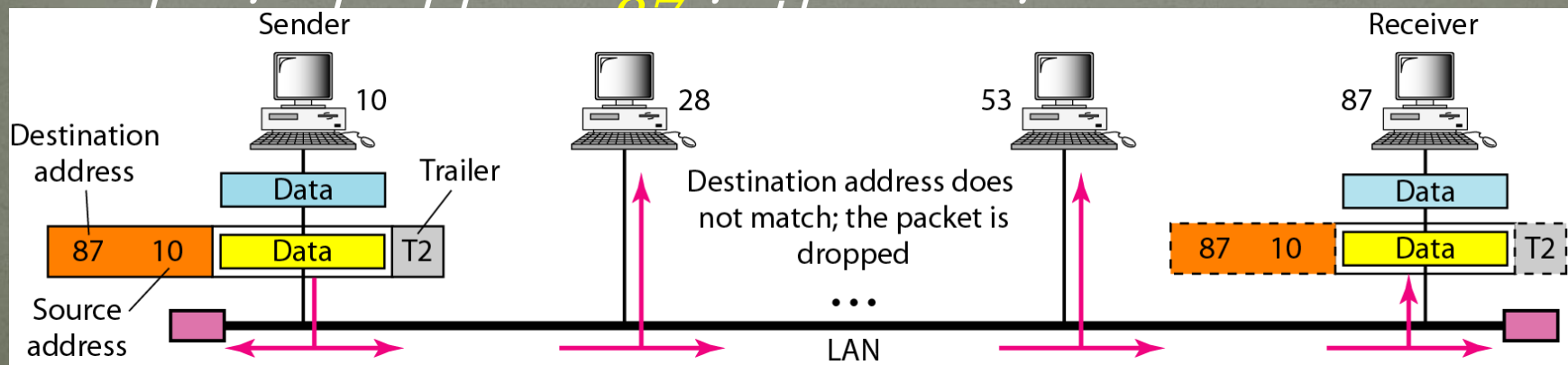


Physical or MAC Address

- Every node in the LAN is identified with MAC address
- Physical address or hardware address
- Unique
- Assigned by the manufacturer
- Represented in hexadecimal
- Switch needs the MAC address to forward the data

Physical Addressing

- A node with physical address 10 sends a frame to a node with physical address 87.
- The two nodes are connected by a link (bus topology LAN).
- As the figure shows, the computer with physical address 10 is the sender, and the computer with



Physical Addressing

- *Most local-area networks use a 48-bit (6-byte)*
- *Physical address written as 12 hexadecimal digits;*
- *every byte (2 hexadecimal digits) is separated by a colon, as shown below:*

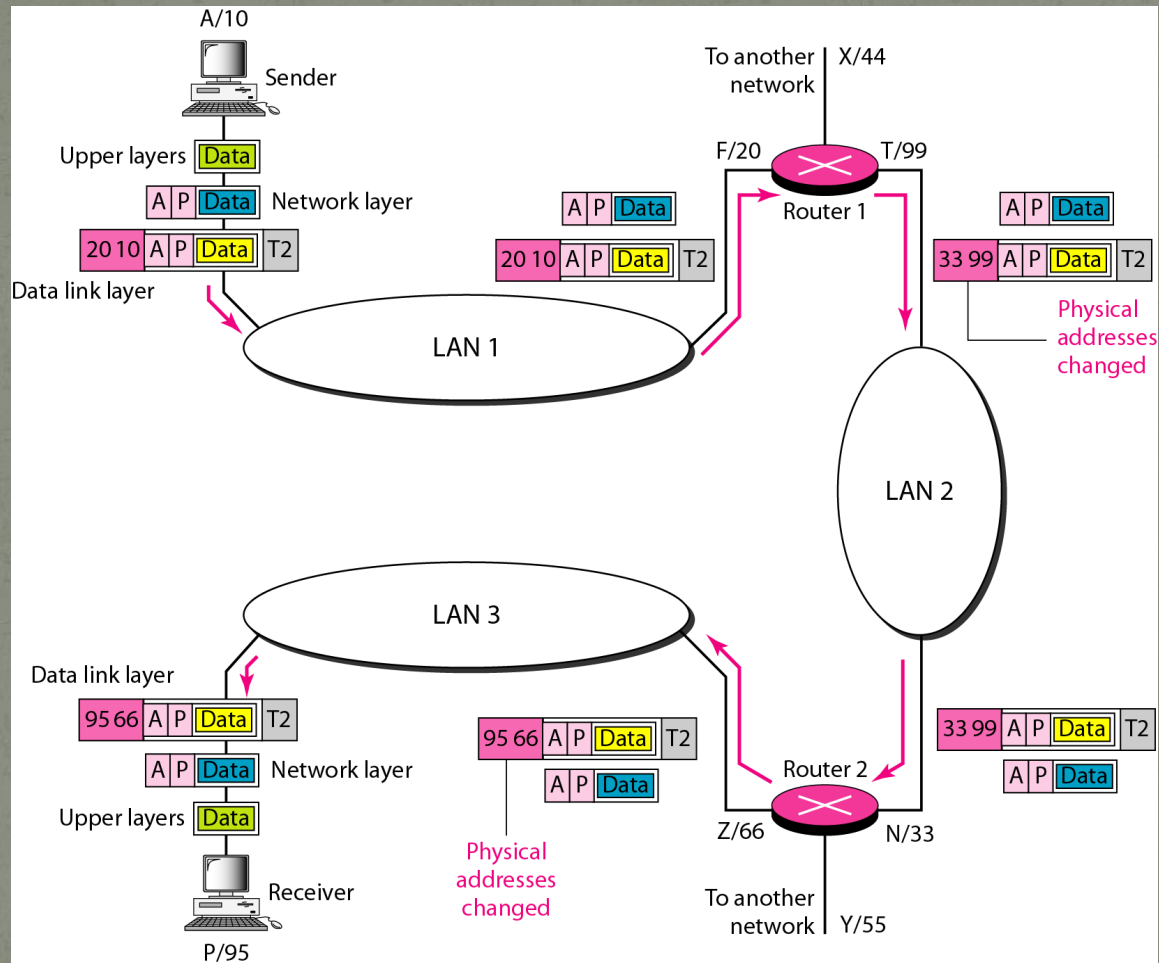
- 07:01:02:01:2C:4B

- Separator (-)hyphen, Period(.)or colon(:)
- **A 6-byte (12 hexadecimal digits) physical address.**

IP Addressing (Logical Addressing)

- Every node in the computer network is identified with the help of IP address
- IPv4 IPv6
- Logical address
- Can be changed on the location of the device
- Assigned manually or dynamically
- Represented in decimal and it has 4 octets(x.x.x.x)
- 0.0.0.0 to 255.255.255.255 (32 bits)

IP Addressing (Logical Addressing)



Logical Addressing

- *A part of an internet with two routers connecting three LANs. Each device (computer or router) has a pair of addresses (logical and physical) for each connection.*
- *In this case, each computer is connected to only one link and therefore has only one pair of addresses.*
- *Each router, however, is connected to three networks (only two are shown in the figure). So each router has three pairs of addresses, one for each connection.*

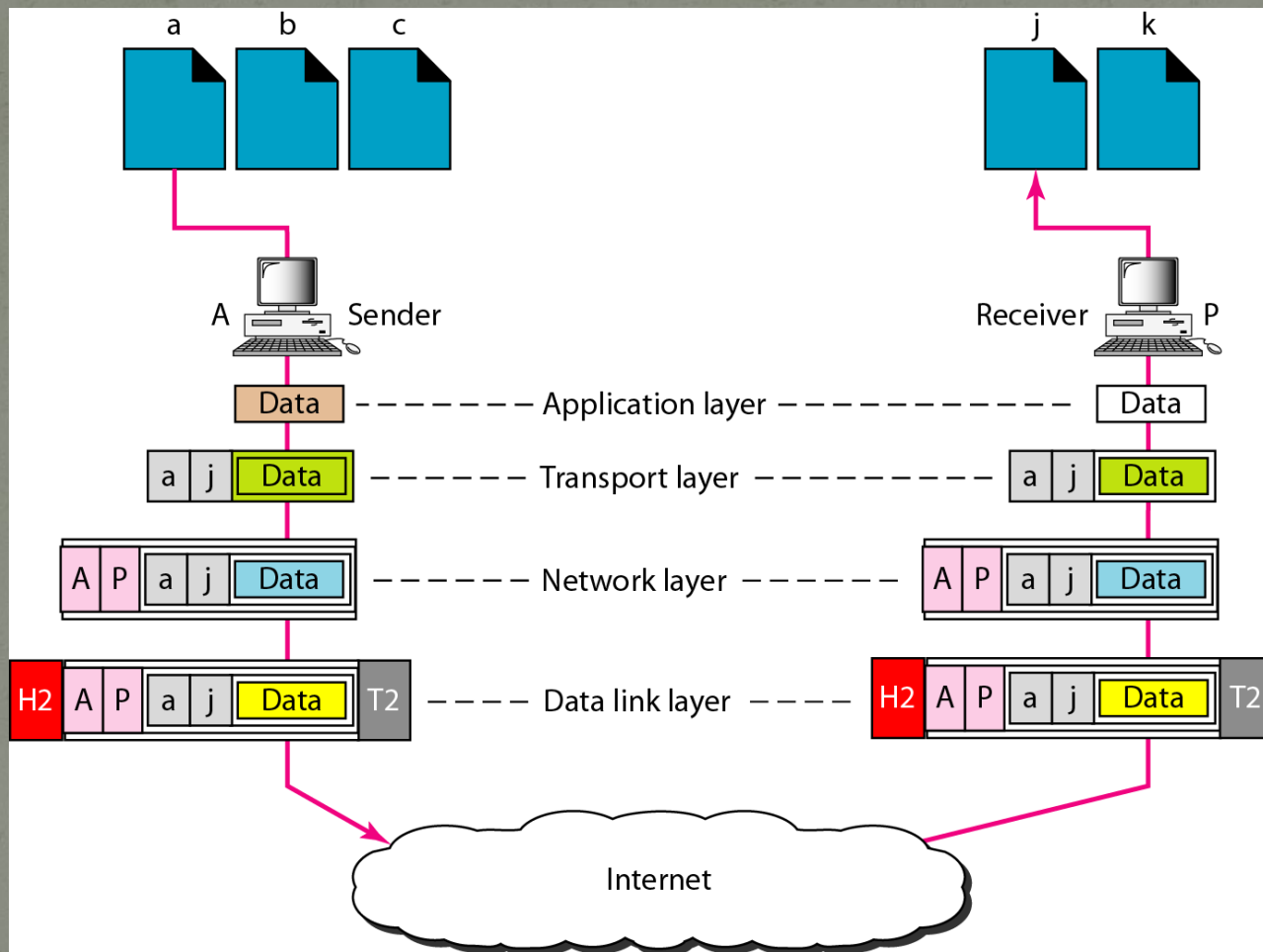
Comparison

IP Address	MAC Address
Needed for communication	Needed for communication
32 Bits	48 Bits
Represented in Decimal	Represented in Hexadecimal
Router needs IP address to forward packets	Switch needs MAC Address to forward frames
Eg 10.10.23.56	10-20-84-00-ED-FC

Port Addressing

- In a node many processors will be running
- Data which are sent/received must reach the correct process
- Every process in a node is uniquely identified using port numbers
- Port = Communication endpoint
- Fixed port numbers and dynamic port numbers
- (0-65535)
- Fixed port number: 25, 80 etc
- OS assigned dynamic port numbers: 62414

Port Addressing



Port Addressing

- *Two computers communicating via the Internet. The sending computer is running three processes at this time with port addresses a , b , and c .*
- *The receiving computer is running two processes at this time with port addresses j and k .*
- *Process a in the sending computer needs to communicate with process j in the receiving computer.*
- *Note that although physical addresses change from hop to hop, logical and port addresses remain the same from the source to destination.*

Port Addressing

- *A port address is a 16-bit address represented by one decimal number as shown.*

• 753

- A 16-bit port address represented as one single number.

Summary

- Peer to Peer process
- Protocols: how it helps in data communication
- The concept of Addressing
- The difference of Physical, Logical and Port Addressing